Malaria
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Malaria

Overview [1,2]

For a more complete description of malaria, refer to the following texts:

- Control of Communicable Diseases Manual (CCDM).
- Red Book, Report of the Committee on Infectious Diseases.

Case Definition [3]

Clinical description

Signs and symptoms are variable; however, most patients experience fever. In addition to fever, common associated symptoms include headache, back pain, chills, sweats, myalgia, nausea, vomiting, diarrhea, and cough. Untreated *Plasmodium falciparum* infection can lead to coma, renal failure, pulmonary edema, and death. The diagnosis of malaria should be considered for any person who has these symptoms and who has traveled to an area in which malaria is endemic. Asymptomatic parasitemia can occur among persons who have been long-term residents of areas in which malaria is endemic.

Laboratory criteria for diagnosis

- Demonstration of malaria parasites in blood films

Case classification

Confirmed: an episode of microscopically confirmed malaria parasitemia in any person (symptomatic or asymptomatic) diagnosed in the United States, regardless of whether the person experienced previous episodes of malaria while outside the country.

Comment

A subsequent attack experienced by the same person but caused by a different *Plasmodium* species is counted as an additional case. A subsequent attack experienced by the same person and caused by the same species in the United States may indicate a relapsing infection or treatment failure caused by drug resistance and is not considered a new case.

Cases also are classified according to the following World Health Organization categories:

- *Autochthonous:*
  Indigenous: malaria acquired by mosquito transmission in an area where malaria is a regular occurrence.
  Introduced: malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.

- *Imported:* malaria acquired outside a specific area (e.g., the United States and its territories).

- *Induced:* malaria acquired through artificial means (e.g., blood transfusion, common syringes, or malariotherapy).

- *Relapsing:* renewed manifestation (i.e., of clinical symptoms and/or parasitemia) of malarial infection that is separated from previous manifestations of the same infection by an interval greater than any interval resulting from the normal periodicity of the paroxysms.

- *Cryptic:* an isolated case of malaria that cannot be epidemiologically linked to additional cases.

Information Needed for Investigation

Verify the diagnosis. What laboratory tests were conducted? What were the results? What laboratory conducted the testing and what is their phone number? What are the patient's clinical symptoms? What is the name and phone number of the attending physician?
Establish the extent of illness. Determine if household, traveling companions, or other close contacts are, or have been ill, by contacting the health care provider, patient or family member.
Determine if the case-patient has a history of foreign travel.
Determine the type of antimalarial chemoprophylaxis used.
Contact the Regional Communicable Disease Coordinator immediately if the case has no remarkable travel history or in-state exposure is suspected.

Case/Contact Follow Up And Control Measures

Determine the source of infection:

- Carefully record the travel history when interviewing a patient: record date of departure, destinations, length of stay, routes, or other details that would identify the

time and location of infection. Delayed primary onset of malaria may occur. The usual incubation period for *P. vivax* is 8-14 days when acquired in tropical and subtropical regions. However, some strains of *P. vivax* from more temperate areas may have longer incubation periods and the disease may not appear for up to 8 to 10 months after exposure.

- Occasionally, malaria relapses will be reported. A relapse may occur if the disease was not adequately treated initially. If the case was previously investigated and the same *Plasmodium* species identified, no further investigation is necessary.

- If there is no history of foreign travel consistent with acquisition of malaria, determine the case-patient's recent medical history, including blood transfusions or medical treatments received outside the United States. Determine if the case-patient lives, works or has visited international airports, shipyards or other areas in which shipments from foreign sources may have been located.

Control Measures
See the Control of Communicable Diseases Manual, Malaria, "Methods of control."

See the Red Book, Malaria, "Control Measures."

Laboratory Procedures

Specimens:
The recognized detection method for diagnosis is microscopic examination of blood smears. Several smears may have to be prepared to observe the parasitemia. Due to the cyclical nature of the parasite's development, a set of negative smears should not rule out malaria if they were made from a single blood specimen. Blood samples for smears should be taken for examination at 12-hour intervals.

Stained and unstained smears should be submitted to the Missouri State Public Health Laboratory (SPHL). The SPHL will send the slides to CDC for final confirmation and species identification. Additional information on laboratory procedures can be obtained from the Regional Communicable Disease Coordinator or from staff at the SPHL. The SPHL web site is: http://www.dhss.state.mo.us/Lab/index.htm. (16 May 2003)

Other diagnostic test methods, which may not be as widely available, include species-specific polymerase chain reaction (PCR) for detection of *Plasmodium* DNA and indirect fluorescent antibody (IFA) tests for detection of antibodies to *Plasmodium* spp. The IFA cannot distinguish between current and previous infection but is of use in screening blood donors or for use in patients in which malaria is suspected but for whom blood smears are

negative. Tests for the detection of histidine rich protein – 2 (HRP-2) and *Plasmodium* associated lactate dehydrogenase (pLDH) are being evaluated.

Reporting Requirements

Malaria is a Category II disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services within three days of first knowledge or suspicion.

1. For all reported cases of malaria complete a "Disease Case Report" (CD-1).
2. For confirmed cases, complete a "Malaria Case Surveillance Report", CDC 54.1.
3. Entry of the completed CD-1 into MOHSIS negates the need for the paper CD-1 to be forwarded to the Regional Health Office.
4. Send the completed secondary investigation form to the Regional Health Office.
5. All outbreaks or "suspected" outbreaks must be reported as soon as possible (by phone, fax or e-mail) to the Regional Communicable Disease Coordinator. This can be accomplished by completing the Missouri Outbreak Surveillance Report (CD-51).
6. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the Regional Communicable Disease Coordinator.

References:

1. Chin, James, ed. "Malaria." Control of Communicable Diseases Manual. 17th ed. Washington, DC: American Public Health Association, 2000: 310-323.
2. American Academy of Pediatrics, "Malaria." In: Pickering, LK. ed. 2000 Red Book: Report of the Committee on Infectious Diseases, 25th ed. Elk Grove Village, IL. 2000: 381-385.
3. Centers for Disease Control and Prevention. Case Definitions for Infectious Conditions Under Public Health Surveillance. MMWR 1997; 46 (No. RR-10). "Malaria," 1995, http://www.cdc.gov/epo/dphsi/casedef/malaria_current.htm (16 May 2003)
4. Centers for Disease Control and Prevention. CDC Travel Information. "Malaria: General Information." http://www.cdc.gov/travel/malinfo.htm (16 May 2003)

Other Sources of Information

1. Centers for Disease Control and Prevention. National Center for Infectious Disease, Division of Parasitic Diseases, "Malaria." http://www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm (16 May 2003)
2. The Merck Veterinary Manual. 8th Ed. Ed. Susan E. Aiello. Whitehouse Station, NJ: Merck & Co., Inc., 1998: 2170. http://www.merckvetmanual.com/mvm/index.jsp (search "malaria"). (16 May 2003)

MALARIA

FACT SHEET

What is malaria?

Malaria is caused by a parasite that is transmitted from person to person by the bite of an infected *Anopheles* mosquito. These mosquitoes are present in almost all countries in the tropics and subtropics. Anopheles mosquitoes bite during nighttime hours, from dusk to dawn. Therefore, antimalarial drugs are only recommended for travelers who will have exposure during evening and nighttime hours in malaria risk areas. Humans are the main reservoir of human malaria. Nonhuman primates can be naturally infected by many malarial species that can infect humans experimentally, but natural transmission to humans is rare.

How can I protect myself from malaria?

Malaria can often be prevented by the use of antimalarial drugs and use of personal protection measures against mosquito bites. The risk of malaria depends on the traveler's itinerary, the duration of travel, and the place where the traveler will spend the evenings and nights.

What if I am pregnant or breastfeeding?

Malaria infections in pregnant women may produce severe consequences. Malaria may increase the risk of adverse pregnancy outcomes, including prematurity, abortion, and stillbirth. Therefore, pregnant women who are traveling to a malaria risk area should consult a physician and take prescription drugs to prevent malaria. Mefloquine may be used during pregnancy for women traveling to areas with chloroquine-resistant *P. falciparum*. Doxycycline should <u>not</u> be used during the entire pregnancy. In chloroquine-sensitive areas, pregnant women should take chloroquine for malaria prevention. Neither mefloquine nor chloroquine has been demonstrated to have a harmful effect on the fetus when it is used to prevent malaria. Very small amounts of antimalarial drugs are secreted in the breast milk of lactating women. The very small amount of drug that is transferred in breast milk is neither harmful to the infant nor does it protect the infant against malaria. Therefore, infants need to be given drugs to prevent malaria.

Are there any special precautions for children?

All children traveling to malaria risk areas, including young infants, should take antimalarial drugs. Therefore, the recommendations for most preventive drugs are the same as for adults, but it is essential to use the correct dosage. The dosage depends on the age and/or the weight of the child.

OVERDOSAGE OF ANTIMALARIAL DRUGS CAN BE FATAL. MEDICATION SHOULD BE STORED IN CHILDPROOF CONTAINERS OUT OF THE REACH OF CHILDREN.

Are the preventive methods 100 percent effective?

Travelers can still get malaria, despite use of prevention measures. Malaria symptoms can develop as early as six to eight days after being bitten by an infected mosquito or as late as several months after departure from a malarious area, after antimalarial drugs are discontinued. Malaria can be treated effectively in its early stages, but delaying treatment can have serious consequences.

What are the symptoms of malaria?

Symptoms of malaria include fever, chills, headache, muscle ache, and malaise. Early stages of malaria may resemble the onset of influenza. Travelers who become ill with a fever during or after travel in a malaria risk area should seek prompt medical attention and should inform their physician of their recent travel history. Neither the traveler nor the physician should assume that the traveler has influenza or some other disease without doing a laboratory test to determine if the symptoms are caused by malaria.

How is malaria diagnosed?

The recognized detection method for diagnosis is blood smears. Your physician will need to make several blood smears on glass slides to detect the parasite. Due to the cyclic nature of the parasite's development, a negative set of smears from a single blood specimen does not rule out malaria. Multiple blood specimens collected at 12 –24 hour intervals may be required to detect the presence of the parasites.

Missouri Department of Health and Senior Services
Section for Communicable Disease Prevention
Phone: (866) 628-9891 or (573) 751-6113

MALARIA CASE SURVEILLANCE REPORT

Department of Health and Human Services, Centers for Disease Control and Prevention
Division of Parasitic Diseases (MS F-22), 4770 Buford Highway, N.E.
Atlanta, Georgia 30341

State Case No: ..... Case No: ..... Form Approved
DASH No: ..... County: ..... OMB 0920-0009

Patient name (last, first):

Date of symptom onset of **this** attack (mm/dd/yyyy): ____/ ____/ _____

Age (yrs): _____ (mos): _____ Sex: ☐ Male ☐ Female
Date of Birth: ____/ ____/ _____
Is patient pregnant? ☐ Yes ☐ No

Physician name (last, first):

Telephone Number: ( ) _____ – _____

Race/ethnicity:
☐ White ☐ Asian/Pacific Islander
☐ Black ☐ American Indian/Alaska Native
☐ Hispanic ☐ Unknown/Not specified

Lab results:
☐ Smear positive ☐ Smear Negative ☐ No Smear Taken
Species (check all that apply):
☐ Vivax ☐ Falciparum ☐ Malariae ☐ Ovale ☐ Not Determined

State/ territory reporting this case: _____
Patient admitted to hospital: ☐ Yes ☐ No
Hospital: _____
Date: ____/ ____/ _____ Hospital record #: _____

Laboratory name:
Telephone Number: ( ) _____ – _____

Specimens being sent to CDC? ☐ Yes ☐ No
If yes: ☐ Smears ☐ Whole Blood ☐ Other: _____

Has the patient traveled or lived outside the USA during the past 4 years? ☐ Yes ☐ No If yes, specify:

	1.	2.	3.
Country:	_____	_____	_____
Date returned/ arrived in U.S. (mm/dd/yyyy):	____/ ____/ _____	____/ ____/ _____	____/ ____/ _____
Duration of stay in foreign country (days):	_____	_____	_____

Did patient reside in U.S. prior to most recent travel?
☐ Yes, for =>12 months
☐ Yes, for <12 months
☐ No, (specify country): _____
☐ Unknown

Principal reason for travel from/ to U.S. for most recent trip:
☐ tourism ☐ visiting friends/relatives ☐ student/teacher
☐ military ☐ airline/ ship crew ☐ other: _____
☐ business ☐ missionary or dependent
☐ Peace Corps ☐ refugee/immigrant

Was malaria chemoprophylaxis taken? ☐ Yes ☐ No If yes, which drugs were taken?
☐ chloroquine ☐ mefloquine ☐ doxycycline ☐ primaquine ☐ Malarone™ ☐ Other: _____

Were all pills taken as prescribed?
☐ Yes, missed no doses
☐ No, missed one to a few doses
☐ No, missed more than a few but < half of the doses
☐ No, missed half or more of the doses
☐ No, missed doses but not sure how many
☐ Don't know

If doses were missed, what was the reason?
☐ Forgot
☐ Didn't think needed
☐ Had a side effect (specify): _____
☐ Was advised by others to stop
☐ Prematurely stopped taking once home
☐ Other (specify): _____

History of malaria in last 12 months (prior to this report)? ☐ Yes ☐ No
If yes, species (check all that apply): ☐ Vivax ☐ Falciparum ☐ Malariae ☐ Ovale ☐ Not Determined
Date of previous illness: ____/ ____/ _____

Blood transfusion/transplant within last 12 months: ☐ Yes ☐ No If yes, date: ____/ ____/ _____

Clinical complications for this attack:
☐ cerebral malaria ☐ ARDS ☐ none
☐ renal failure ☐ anemia (Hb<11, Hct<33) ☐ other: _____

Was illness fatal: ☐ Yes ☐ No ☐ Unknown
If yes, date of death: ____/ ____/ _____

Therapy for this attack (check all that apply):
☐ chloroquine ☐ tetracycline/doxycycline ☐ mefloquine ☐ exchange ☐ unknown
☐ primaquine ☐ quinine/quinidine ☐ pyrimethamine-sulfadoxine ☐ transfusion ☐ other (specify): _____
☐ Malarone

Person submitting report: _____ Telephone No.: _____
Affiliation: _____ Date: ____/ ____/ _____

For CDC Use Only. ☐ Classification ☐ imported ☐ induced ☐ introduced ☐ congenital ☐ cryptic

 If sending specimens, please forward blood smears (thick and thin) with this report.